TSVETKOV, V.
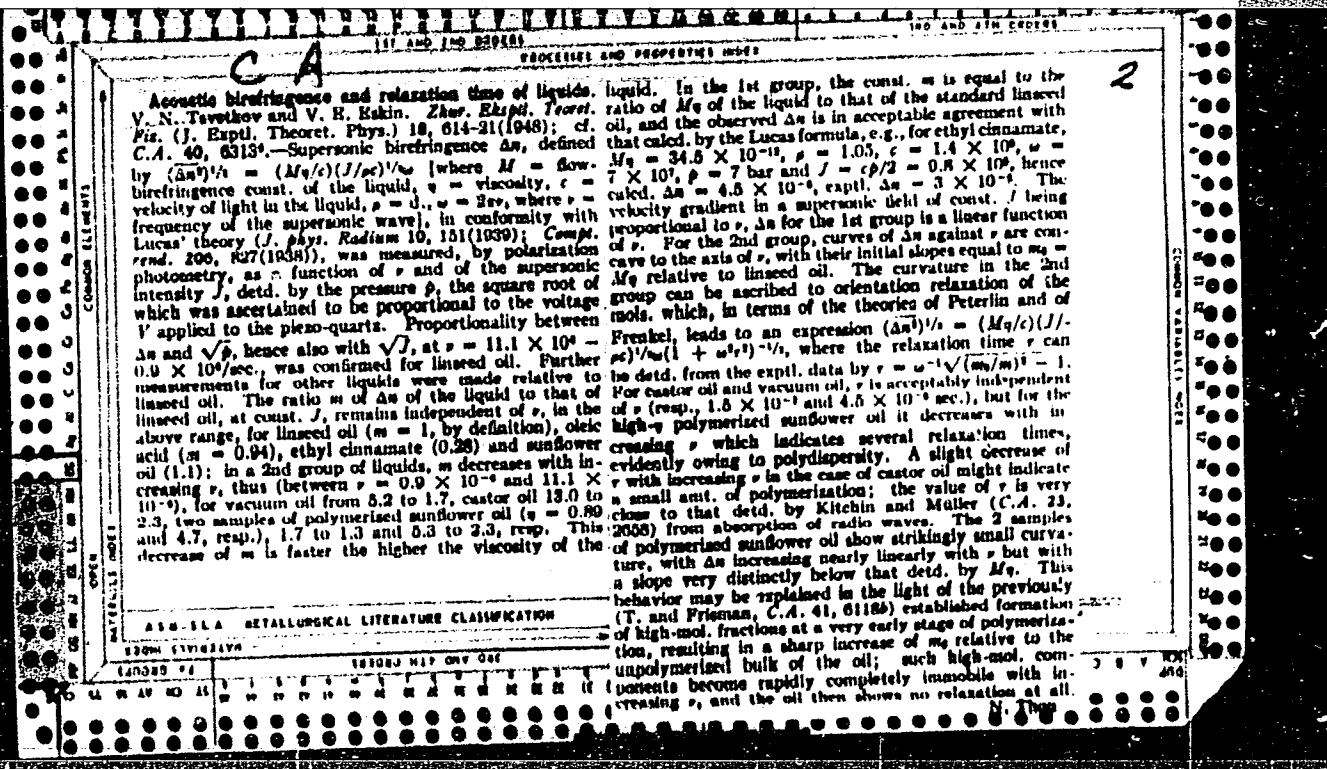
25372. TSVETKOV, V. i MARININ, V.
Dipol'nye momenty molekul nekotorykh zhidkikh kristalov 1 elektrichekoe
dvoynoe luchepelomlenie ikh rastvorov. Zhurnal eksperim I teoret. Fiziki, 1948,
Vyp. 7, S 641-50. - Bibliog: S. 650

SO: Letopis' Zhurnal Statey, No. 30, Moscow, 1948

Depolarization of the light scattered by polymer solutions. E. Fridman and S. Tuschkin. (Leningrad State Univ.) J. Expll. Theoret. Phys. (U.S.S.R.) 18, 1311 (1948) (in Russian).—The degree of depolarization Δ of light incident along the x axis and scattered in the direction of the y axis, was detd. for both unpolarized incident light (Δ_u), and for incident light polarized horizontally, i.e. with the electric vector parallel to the xy plane (Δ_h) and vertically (Δ_v). (1) Detns. on pure styrene, in the course of its polymerization at 60°, showed Δ_v to be practically const. $= 1$, irrespective of the progress of polymerization; Δ_u and Δ_h remain unchanged from the value of the monomer over approx. the 1st 6 hrs. Then there is an abrupt fall, followed by a very slow prolonged rise. The fall indicates a sudden decrease of the anisotropy of the scattering particles; the residual depolarization is due to continued influence of the monomer. Particularly noteworthy is the indication of the sudden formation of isotropic polymer chains at an early and well-detd. stage of the polymerization process, as opposed to gradual growth of polymer particles which would be accompanied by progressive and not by the observed sudden fall of Δ_u and Δ_h. The constancy of $\Delta_v = 1$ at all stages shows that the scattering particles are much smaller than the wave length of light. The decrease of the anisotropy $\delta^2 = 10 \Delta_v/(6-7\Delta_v)$ in the course of the polymerization, is addnl. proof of the clue shape of the polymer mol., as opposed to a rod shape which would call for a const. δ^2. Pure methyl

over →

methacrylate shows also a const. $\Delta_s = 1$; Δ_a and Δ_s fall steeply, but not suddenly, from the very start of the polymerization, reach a low at about 8 hrs. and then rise very slowly. (2) Solns. of polystyrene in CCl$_4$ gave a very low $\Delta_a = 0.005$, and $\Delta_s = $ const. $= 1$. With increasing concn., Δ_a and Δ_s first remain const. up to about 3 vol. %, then increase. At the very lowest concns., rise of Δ_a with increasing diln. between about 0.3 and 0 vol. % was observed on one sample. Tech. polyisobutylene (oppanol) showed a different behavior; Δ_a and Δ_s are const. only at lowest concns. (up to about 0.3 vol. %). They then increase with increasing concn., the smallest Δ_a and Δ_s being distinctly higher than in the case of polystyrene, Δ_s increasing slowly and Δ_a very rapidly with the concn.; Δ_a is greater than 1 even in dil. soln. and increases still further with the concn. (3) The small value of $\Delta_a = 0.005$ (in 5 vol. % soln. in CCl$_4$) is of the same order as that found for the very nearly isotropic gaseous CCl$_4$ or for oil emulsions. It can neither be accounted for by a rotation-ellipsoid symmetry of the mol. nor by Brownian movement. Likewise, Rousset's multiple scattering, which calls for increase of the Δ with the concn. in dil. soln., is inapplicable. The observed Δ_a can only be ascribed to the effect of the solvent; the anisotropy of the dissolved polymer particles is evidently negligible, and is consistent with the kinked-clue shape of the mol. In the case of polyisobutylene, Δ_a is greater than 1 and indicates that the size of the particles is comparable to the wave length of light, hence, the scattering particles must be micellar aggregates of many mols., each mol., of mol. wt. 130,000 and degree of polymerization 2000, being at most 2×10^4 A. long if stretched, less than that if folded. The aggregates obviously are unstable and disaggregate on diln., hence the fall of Δ_a with falling concn. A limit $\Delta_a = 1$ at infinite diln. is possible. N. Thon

C A

2

PROCESSES AND PROPERTIES INDEX

Acoustic birefringence and relaxation time of liquids.
V. N. Tsvetkov and V. E. Eskin. *Zhur. Eksptl. Teoret.
Fiz.* (J. Exptl. Theoret. Phys.) **18**, 614-21(1948); cf.
C.A. **40**, 6313[4].—Supersonic birefringence Δn, defined
by $(\Delta n)^{1/2} = (Mq/c)(J/\rho c)^{1/2}$ [where M = flow-
birefringence const. of the liquid, v = viscosity, c =
velocity of light in the liquid, ρ = d., ω = $2\pi\nu$, where ν =
frequency of the supersonic wave], in conformity with
Lucas' theory (*J. phys. Radium* **10**, 151(1939); *Compt.
rend.* **206**, 827(1938)), was measured, by polarization
photometry, as a function of ν and of the supersonic
intensity J, detd. by the pressure ρ, the square root of
which was ascertained to be proportional to the voltage
V applied to the piezo-quartz. Proportionality between
Δn and $\sqrt{\rho}$, hence also with $\sqrt{J}$, at ν = 11.1 × 10⁶ –
0.9 × 10⁶/sec., was confirmed for linseed oil. Further
measurements for other liquids were made relative to
linseed oil. The ratio m of Δn of the liquid to that of
linseed oil, at const. J, remains independent of ν, in the
above range, for linseed oil (m = 1, by definition), oleic
acid (m = 0.94), ethyl cinnamate (0.28) and sunflower
oil (1.1); in a 2nd group of liquids, m decreases with in-
creasing ν, thus (between ν = 0.9 × 10⁶ and 11.1 ×
10⁶), for vacuum oil from 5.2 to 1.7, castor oil 13.0 to
2.3, two samples of polymerized sunflower oil (ν = 0.80
and 4.7, resp.), 1.7 to 1.3 and 5.3 to 2.3, resp. This
decrease of m is faster the higher the viscosity of the

liquid. In the 1st group, the const. m is equal to the
ratio of Mq of the liquid to that of the standard linseed
oil, and the observed Δn is in acceptable agreement with
that calcd. by the Lucas formula, e.g., for ethyl cinnamate,
$Mq = 34.5 × 10^{-11}$, ρ = 1.05, c = 1.4 × 10⁶, ω =
7 × 10⁷, ρ = 7 bar and J = $c\rho/2$ = 0.8 × 10⁶, hence
calcd. Δn = 4.5 × 10⁻⁸, exptl. Δn = 3 × 10⁻⁶. The
velocity gradient in a supersonic field of const. J being
proportional to ν, Δn for the 1st group is a linear function
of ν. For the 2nd group, curves of Δn against ν are con-
cave to the axis of ν, with their initial slopes equal to m_0 =
Mq relative to linseed oil. The curvature in the 2nd
group can be ascribed to orientation relaxation of the
mols. which, in terms of the theories of Peterlin and of
Frenkel, leads to an expression $(\Delta n)^{1/2} = (Mq/c)(J/-
\rho c)^{1/2}(1 + \omega^2\tau^2)^{-1/2}$, where the relaxation time τ can
be detd. from the exptl. data by $\tau = \omega^{-1}\sqrt{(m_0/m)^2 - 1}$.
For castor oil and vacuum oil, τ is acceptably independent
of ν (resp., 1.5 × 10⁻⁹ and 4.5 × 10⁻⁹ sec.), but for the
high-ν polymerized sunflower oil it decreases with in-
creasing ν, which indicates several relaxation times,
evidently owing to polydispersity. A slight decrease of
τ with increasing ν in the case of castor oil might indicate
a small amt. of polymerization; the value of τ is very
close to that detd. by Kitchin and Müller (C.A. **23**,
2058) from absorption of radio waves. The 2 samples
of polymerized sunflower oil show strikingly small curva-
ture, with Δn increasing nearly linearly with ν but with
a slope very distinctly below that detd. by Mq. This
behavior may be explained in the light of the previously
(T. and Frisman, C.A. **41**, 6118b) established formation
of high-mol. fractions at a very early stage of polymeriza-
tion, resulting in a sharp increase of m_0 relative to the
unpolymerized bulk of the oil; such high-mol. com-
ponents become rapidly completely immobile with in-
creasing ν, and the oil then shows no relaxation at all.
N. Thon

TSVETKOV, V.

PA 9/49T86

USSR/Physics
    Refraction, Double
    Dielectric - Constants

Jul 48

"Dipole Moments of the Molecules of Some Liquid Crystals and the Electric Double Refraction of Their Solutions," V. Tsvetkov, V. Marinin, Phys Inst, Leningrad State U, 3 pp

"Zhur Eksper 1 Teoret Fiz" Vol XVIII, No 7

Measurement of dielectric constants and analysis of electrical double refraction of solutions of seven materials suitable for forming liquid crystals. Compares values found in dielectric analyses, for dipole moments of molecules, with

USSR/Physics (Contd)   Jul 48

values obtained for electrooptical constants of materials in solution. By this comparison, angle formed by molecular dipole moment with molecular axis is found and then compared with dielectric properties. Shows that liquid crystals have negative dielectric anisotropy whose molecules have a dipole forming a nearly straight angle with molecule's axis, and that positive dielectric anisotropy is inherent in anisotropic liquids whose molecules have dipole moments forming small angles with molecular axis. Negative dielectric anisotropy is determined, apparently by molecular dipoles anisotropic rotation; positive dielectric anisotropy, by molecules' polarization.

9/49T86

9/49T86

TSVETKOV, V. N.

PA 9/49T87

USSR/Physics
Refraction, Double
Relaxation Phenomena

Jul 48

"Acoustical Double Refraction and the Relaxation
Time of Liquids," V. N. Tsvetkov, V. Ye. Eskin,
Phys Inst, Leningrad State U, 8 pp

"Zhur Eksper i Teoret Fiz" Vol XVIII, No 7

Study of relationship of acoustic double refrac-
tion in linseed oil to intensity of ultrasound
for various given frequencies; character of
acoustic double refraction in a series of low
molecular liquids, as well as in eight liquids
in frequency interval 0.9×10^6 -- $11.1 \times 10^6 sec^{-1}$. Notes relaxation phenomena in

9/49T87

USSR/Physics (Contd)   Jul 48

four of liquids. Approximate times of relaxation
for molecules of castor oil and mineral vacuum oil
found to be: 1.5×10^{-7} sec and 4.5×10^{-8} sec.

9/49T87

Relaxation effects in liquids in supersonic fields. V. N. Tsvetkov and V. E. Eskin. *Doklady Akad. Nauk S.S.S.R.* **59**, 1040-02(1048).—The acoustic birefringence B, in a supersonic field of const. intensity, was detd. relative to that of linseed oil (of viscosity η 0.49 poise) taken = 1 at all frequencies from 0.9×10^9 to 11.1×10^9 sec.$^{-1}$, for 7 liquids of different η: oleic acid (I) (η 0.24), ethyl cinnamate (II) (0.07), sunflower oil (III) (0.57), vacuum oil (IV) (5.9), castor oil (V) (9.1), polymerized sunflower oil (VI) (0.80), and a higher polymerized sunflower oil (VII) (4.7). The ratio m of the B of the liquid investigated and of linseed oil was found practically independent of the frequency ω for the low-η liquids I–III, and equal to the ratio m_0 of the flow birefringence; hence, for these liquids, B is a linear function of ω. The deviation from linearity in the case of IV–VII indicates relaxation effects. The relaxation times τ, calcd. by $\tau = (1/\omega)\sqrt{(m_0/m)^2 - 1}$ vary, with ω from 5.7 to 69.0 $\times 10^9$, for V between 1.77 and 1.15×10^{-1} (av. 1.5×10^{-1} sec.), for IV between 3.48 and 6.82 (av. 4.5×10^{-1} sec.), for VII between 2.78 and 0.62×10^{-1} sec.; only in the latter case does one observe a systematic fall of τ with increasing ω, indicative, no doubt, of the presence of several τ, owing to polydispersity of the system.

N. Thon

C A

Electric birefringence of solutions of normal alcohols.
V. N. Tsvetkov and V. Marinin. *Doklady Akad. Nauk S.S.S.R.* 62, 67-70(1948).—The Kerr const. K was detd. in C_6H_6 soln. for (data in units $\times 10^{-10}$): PrOH −9.3, BuOH −16.0, AmOH −17.0, $C_6H_{13}OH$ −21.0, $C_7H_{15}OH$ −19.7, $C_8H_{17}OH$ −18.5, $C_9H_{19}OH$ −13.0, $C_{10}H_{21}OH$ −6.2, $C_{11}H_{23}OH$ + 2.5, $C_{16}H_{33}OH$ + 13.0, $C_{18}H_{37}OH$ + 70.3. Calcd. values of K were obtained by $K = (2/9) \pi (N/45 kT) [\Sigma (\gamma_i - \gamma_k)^2 + (1/kT) \Sigma (\gamma_i - \gamma_k)(p_i^2 - p_k^2)]$ where the summation extends over $i, k = 1, 2, 3$, the γ being the polarizabilities in the 3 principal directions, the p the components of the dipole moment in the same 3 directions. For the polarizabilities a_1, a_2, a_3 of a CH_2 group one finds, on the assumption of an additivity of the polarizabilities of the C—H and the C—C bonds, and with the values of Denbigh (*C.A.* 35, 671[5]) $a_1 = 24.3 \times 10^{-25}$, $a_2 = 19.3 \times 10^{-25}$, $a_3 = 14.7 \times 10^{-25}$; a test is provided by a comparison of the mean value, $a = (a_1 + a_2 + a_3)/3 = 19.4 \times 10^{-25}$, with the value derived from the mean increment of the molar refraction per CH_2 group ($= 4.6$), giving $a = 18.3 \times 10^{-25}$, i.e. a divergence of only 6%. For a strictly rigid, sufficiently long chain, the γ can be taken $\gamma_i = a_i (s + a)$,

where $s =$ no. of CH_2 groups, $a =$ a const. with allowance for the effect of the end groups. Replacing the γ_i in the expression for K, one has, with $a = 2$, $K = (2/9) \pi (N/45 kT)[(6 \Delta a^2 (s + 2)^2] + [3 \Delta a (s + 2) (p_1^2 - p_2^2)/kT]$, where $\Delta a = a_1 - a_2 = a_2 - a_3 = 4.6 \times 10^{-25}$. The dipole moment is composed of the moment of the C—O bond $= 0.7 \times 10^{-18}$, lying in the plane of the C—C bond, and of the moment of the O—H bond $= 1.74 \times 10^{-18}$, the direction of which is unknown. It obviously cannot lie in the same plane as C—O, as, in that case, $p_3 = 0$ and K could not be neg. at any s. The K calcd. on the assumption of O—H pointing in the same direction as C—H, which gives $p_1^2 - p_2^2 = -2.4 \times 10^{-36}$, are too neg. as compared with the exptl. figures. Best agreement is obtained with $p_1^2 - p_2^2 = -0.65 \times 10^{-36}$ which corresponds to locating the O—H bond between the plane of the C—C bonds and that of the C—H bonds. The agreement proves that paraffins up to $s = 36$ behave in soln. as straight rigid chains.　　　　N. Thon

TSVETKOV, V.

PA 36/49T72

USSR/Physics
    Light- Diffraction   Sep 48
    Benzene

"Temperature Relationship of Dynamic Double Dif-
raction of Benzene and Other Liquids," V. Tsvetkov,
Kh. Kibardina, Phys Inst, Leningrad State U, 4 pp

"Dok Ak Nauk SSSR" Vol LXII, No 2

Dependence of double diffraction on temperature was
studied for the following liquids: benzene, aceto-
phenone, naphthalene, biphenyl, diphenyl ether,
diphenylamine, salol and lactic acid. Temperatures
close to those of crystallization were used. Sub-
mitted by Acad A. A. Lebedev, 9 Jul 48.

36/49T72

TSVETKOV, V.

PA 35/49190

USSR/Physics
   Sound - Refraction
   Sound - Measurements

Dec 48

"The Compensated Method of Measuring the Acoustic Double-Refraction of Liquids," V. Tsvetkov, V. N. Marinin, Phys Inst Leningrad State U, 4 pp 613.26

"Dok Ak Nauk SSSR" Vol LXIII, No 6

Suggests method for direct compensation of double-refraction with the aid of a compensator (wedge-shaped or elliptical) which allows measuring the value of the acoustic double-refraction at any point in the field. Diagram shows optical arrangement for the method, and pictures of acoustic double-refrac-tion where the distance between two neighboring light (or dark) bands is one half the ultrasonic wave length. Graph shows acoustic double refrac-tion in castor and sunflower oils versus effective voltage on the quartz for ultrasonic frequency of 2.6 · 10^6.
18 Oct 48.   Submitted by Acad A. A. Lebedev,

35/49T98

C A

Rotating magnetic field as a method of studying colloidal systems. V. I. Tumanov and M. Konikoff. Kolloid. Zhur. 11, (97-20)(1940).—A roughly cylindrical container, 1 cm. in diam., filled with a colloidal sols, was rotated about the cylinder axis between the poles of an electromagnet. The magnetic field produced torque L on every sol particle but frictional torque W retarded their orientation so that there was a lag of α between the direction of the field and that of the particles; α was detd. by observing the sol along the cylinder axis between crossed nicols and rotating the nicols until dark. Sols prepd. by mixing alc. so ns. of p-azoxyanisole (I) or anisaldazine (II) with much H_2O showed proportionality between $\sin 2\alpha$ and the frequency of rotation ν as long as ν was less than 3 sec.$^{-1}$. At greater ν the whole liquid in the container rotated. In graphite sols (III) prepd. in an elec. arc under H_2O the curve of $\sin \alpha$ against ν was concave toward the ν axis at all ν. When the field intensity H was varied (up to 15,000 oersteds), I and II showed proportionality between $\sin \alpha$ and H^{-2}, as would be expected from anisotropic diamagnetic particles; III showed proportionality between $\sin \alpha$ and H^{-1} as if graphite particles had a const. magnetic moment; and sols prepd. by elec. dispersion of Fe in H_2O behaved as a ferromagnetic substance. L was proportional to viscosity which was varied by addn. of glycerol. By combining the data on α with birefringence or dichroism of the sols in magnetic field W was calcd. for I, II, anisalaminoazobenzene, acetoxybenzalazine, and dibenzalbenzidine. The particles of I, e.g., had a vol. of 3×10^{-14} cc. and their ratio length: width was 2.5.

J. J. Bikerman

TSVETKOV, V.   FA 170T105

USSR/Physics - Colloids   Jun 49

"Studying the Geometric and Magnetic Properties of
Colloidal Particles by the Methods of Magnetic and
Dynamic Birefringence of Light," V. Tsvetkov, M. So-
sinskiy, Leningrad State U

"Zhur Eksper i Teoret Fiz" Vol XIX, No 6, pp 543-52

New method for studying colloidal systems by double
refraction and dichroism of colloidal solution in
stationary and rotating magnetic field, and in lam-
inar flow determines volume of colloidal particles,
their coefficient of elongation, and magnitude of
magnetic anisotropy. Submitted 27 Feb 49.

                                        170T105

Dynamic double refraction in solutions of polymers of **bivinyl and methyl methacrylate.** V. N. Tsvetkov and A. Petrova. *Zhur. Fiz. Khim.* 23, 268-78(1949); cf. *C.A.* 40, 2059³; 42, 1081*e*.—(1) Butadiene (I) polymerized with Na was fractionated by pptg. dichloroethane soln. with EtOH and the fractions were dissolved in gasoline. The relative viscosity η, of these solns. was independent of the velocity gradient g for low-mol. fractions; at $g >$ when g increased for high mol. wt. fractions; at $g >$ 15000 sec.$^{-1}$ η, was independent of g for all fractions. The dynamo-optical const. $X = \Delta n/g C \eta_0 ./\eta$ was characteristic for every fraction and proportional to its (viscometric) mol. wt. M; Δn is birefringence caused by g (detd. in 0.1-0.3 mm. thick layer between a stationary and a rotating cylinder). C concn., η the viscosity of the solvent. For the extinction angle α the equation found is $\tan 2\alpha - \tan 2\alpha_0 = 6kT/g\eta\eta./\eta W$; α_0 is an empirical const. (although it should be zero according to theory), and W is the friction coeff. for rotation). W increases with M less rapidly than M^2; this constitutes a difference between linear polymers, cf. *C.A.* 40, 788³, and branched polymers such as poly-I. The X in solvents whose n is near 1.47 (CHCl₃, dichloroethane, and CCl₄) is less than in gasoline, Et₂O, C₆H₆, PhCl, and tetralin (whose n is smaller or greater), showing that the flow birefringence is due mainly to the shape of the polymer mol. (2) Copolymers of I and styrene have (in tetralin and dichloroethane) a pos. X and a pos. photoelastic effect as long as the amt. of I is less than about 33%; the sign of both is pos. in I-richer polymers. Apparently, photoelastic effect, like shape effect, is a part of the Maxwell effect. (3) Poly(methyl methacrylate) (II), $M = 450,000$, has a very which is small for its M; η, in COMe₂ and CHCl₃ is independent of g at $g > 8000$ and, in this range, little changes on the solvent. The η, X, and α of the solns. are lowered when large g (>35,000) is applied for several min., thus indicating decrease in the particle size. In COMe₂

$\Delta n/g = $ const. C up to $C = 0.5\%$, and $X = \Delta n/g C \eta_0$ in all solvents (COMe₂, AcOEt, CHCl₃, C₂H₄Cl₂, C₆H₆, PhCl, and CHBr₃). X has a min. in C₆H₆ whose n is near that of II (1.49), showing the preponderance of the birefringence due to shape. The mol. of II seems to be relatively rigid.   J. J. Bikerman

TSVETKOV, V. Ha.

24475   TSVETKOV, V. Ha. Stadionakh Yevropy. (Sport v stranakh nar. Demokratii).
Ogonek, 1949, No. 31, S. 30-31.

SO: Letopis, No. 32, 1949.

C A

Flow birefringence and relaxation time of normal alcohols. V. N. Tsvetkov and K. Frisman. *Doklady Akad. Nauk S.S.S.R.* 67, 49-72(1949).—From measurements of the viscosity η, and the birefringence Δν at the velocity gradient *t*, the dynamo-optical const. *M* = Δν/ηg was detd. for: hexyl alc., 293°K., η = 0.0420 poises, 10¹¹ Δν/g = 1.80, 10¹¹ *M* = 9.80; heptyl alc., 293°, 0.0481, 4.35, 5.01; octyl alc., 313°, 0.0680, 6.80, 7.35; nonyl alc., 293°, 0.1115, 10.7, 9.60; decyl alc., 293°, 0.1395, 17.4, 12.5; tetradecyl alc., 312°, 0.1300, 21.5, 21.1; cetyl alc., 324°, 0.1145, 28.0, 24.5; octadecyl alc., 338°, 0.0908, 25.2, 26.0; ceryl alc., 365°, 0.0792, 24.8, 31.3. With the 3 principal polarizabilities $\gamma_i = b_i(Z + a_i)$, where the principal polarizabilities of one CH₂ group, $b_1 = 24 \times 10^{-25}$, $b_2 = 10 \times 10^{-25}$, $b_3 = 11 \times 10^{-25}$, Z = no. of C atoms, and *a* = common const. for all normal alcs., and with the mol. assimilated to an elongated ellipsoid with the axes $a_1 > a_2 = a_3$, of which a_1 is assumed = 4.6 × 10⁻⁸ cm., a_1 for octyl alc. = 12.6 × 10⁻⁸ cm. and increasing by 1.55 × 10⁻⁸ cm 35° per CH₂ group, *M* was also calcd. by the Raman-Krishnan (*C.A.*

22, 3574) or the Peterlin-Stuart (*C.A.* 33, 9081⁹) formulas. Both give *M* values higher than the exptl. figures, with better agreement with the R.-K. formula, except for lower homologs up to Z = 10 for which the exptl. curve agrees better with the P.-S. theory. The degree of depolarization A of scattered light was detd. to be (in the above order) 0.17, 0.16, 0.31, 0.23, 0.24, 0.26, 0.30, 0.30, 0.30, with these values, and values of the compressibilities β calcd. from the velocity of supersonic waves, with the adiabatic β taken to be 20% higher than the isothermal β the relaxation times τ of enforced anisotropy of the liquids, calc'd. by the equation of M. A. Leontovich (*C.A.* 36, 4410⁹) are; 10¹¹ τ = 4.24, 18.2, 44.3, 84.6, 167, 346, 364, 324, 28w; the order of mag. altude agrees with results obtained from dielec. losses. The relaxation time first increases rapidly with Z, then decreases somewhat, owing to lower η of higher alcs. The ratio τ/η for ceryl alc., 3.77 × 10⁻⁹, is in good agreement with the 2.7 times greater τ/η = 1.02 × 10⁻⁸ detd. by acoustic birefringence for castor oil (at 50°), if the ratio of the mol. wts. (1000/282 = 2.0) is taken into account. Relaxation times calcd. by $\tau = \eta / RT$, where ω = vol. of a mol., *f* = form factor detd. by a_1/a_2 (Tsvetkov and Frisman, *C.A.* 40, 788⁴), are of the distinctly higher order of 10⁸. N. Thon

Relaxation of the enforced anisotropy in liquids. V. N. Tsvetkov and V. E. Eskin. *Doklady Akad. Nauk S.S.S.R.* 67, 363-6(1949); cf. *C.A.* 43, 3681d.—The dependence of the orientation relaxation time τ on the viscosity η was detd. by measurements of the acoustic and the flow birefringence of castor oil, pure at different temps. or dild. with gasoline at a const. temp., relative to linseed oil as standard liquid, with the aid of the formula $\tau = (1/\omega) \left[(m_0/m)^2 (1 + \omega^2 \tau_1^2) - 1 \right]^{1/2}$, where $\omega = 2\pi\nu = 6 \times 10^6 - 70 \times 10^6 \sec.^{-1}$, m = ratio of the acoustic birefringences of the castor oil and the standard liquid at the frequency ω, m_0 = the same ratio in flow birefringence $(\omega = 0)$, τ_1 = relaxation time of the standard liquid; if $\omega^2 \tau_1^2 \ll 1$, the formula simplifies to $\tau = (1/\omega) \left[(m_0/m)^2 - 1 \right]^{1/2}$, exptly. found to be sufficient except at $\omega = 70 \times 10^6$. On variation of η by varying the temp. of pure castor oil, the results were, at 15, 20, 25, 30, 40, 50°, $\eta = 17.10, 9.40, 6.27, 4.50, 2.41, 1.27$ poises, and $10^8 \tau$ (av.) = 23.0, 17.1, 11.7, 6.9, 4.2, 1.5 sec. At the const. temp. of 20°, with the castor oil dissolved in gasoline at the concn. −100 (pure oil), 95.8, 93.2, 89.1, 86.1, 83.7, 80.1, 76.0%, $\eta = 9.45, 6.73, 5.43, 3.87, 2.81, 2.17, 1.60, 1.20$ poises, $10^8 \tau$ (av.) = 17.0, 11.1, 7.4, 5.3, 5.6, 4.8, 3.3, 1.7 sec. At a given η, the fluctuations of η with varying ω do not exceed the limits of exptl. error. This indicates that the orientation relaxation can be described in terms of one single τ (monodisperse system). The coeff. of rotational friction of the mol., $W = kT/\eta D$, where the rotational diffusion coeff. of the mol. $D = 1/\eta\tau$, calcd. from the data

at different temps., is fairly const., $3.2 \times 10^{-21} - 4.6 \times 10^{-21}$, without any systematic variation in terms of η or the temp. Consequently, temp. changes of the "microscopic" η (that involved in the definition of W) coincide with those of the "macroscopic" (i.e. viscosimetric) η. This coincidence is not fulfilled in the case of variation of c, where the fluctuations of W exceed the limits of exptl. error. At 50°, $\eta = 1.27$ poise, $\tau = 15 \times 10^{-9}$, i.e. only 4 times greater than the value detd. for CHCl₃ from Kerr-effect measurements (Hanle and Maercks, *C.A.* 34, 3145⁷); for castor oil, extrapolation to $\eta \sim 0.005$ poise would give $\tau = 6 \times 10^{-11}$, i.e. $1/\infty$ of the value for CHCl₃. On the other hand, for CHCl₃, from dielec. losses, $W \sim 5 \times 10^{-22}$, comparing with $W \sim 4 \times 10^{-21}$ for castor oil; the agreement is satisfactory if the elongated form and the much larger vol. of the ricinoleic acid triglyceride mol. are taken into account. Thus, the relaxation time of optical anisotropy of liquids, detd. by acoustic birefringence, is in agreement with that derived from measurements of dielec. losses, but not the value calcd. from the Kerr effect.   N. Thon

TSVETKOV, V.

PA 2/50T107

USSR/Physics - Ultrasonics   Sep 49
Optics

"An Optical Method of Measuring the Speed of
Ultra Sound," V. Tsvetkov, V. Marinin, Phys Inst,
Leningrad State U imeni A. A. Zhdanov, 4 pp

"Dok Ak Nauk SSSR Nov Ser", Vol LXVIII, No 1

Introduces a new optical method based on direct
observation of an ultrasonic grating created by
a plane ultrasonic wave during its stroboscopic
illumination with aid of a light lock synchronized
with ultrasonic generator. Used this method to
obtain molar speed of ultra sound in a number of

2/50T107

USSR/Physics - Ultrasonics
Optics (Contd)   Sep 49

saturated fatty acids and normal alcohols.
Submitted by Acad A. A. Lebedev 27 Jun 49.

2/50T107

CA

Investigation of fractionated polybutadienes by a dynamo-optical method. V. N. Tsvetkov, A. I. Petrova, and I. Ya. Poddubnyl (Leningrad State Univ., Leningrad). *Zhur. Fiz. Khim.* **24**, 994-1003(1950).—Solns. of various fractions of polybutadienes obtained at various temps. of polymerisation were studied by dynamo-optical double refraction. The double refraction was lineally related to the rate gradient. Conclusions are drawn concerning the form of the macromol. in various solvents and the effect of the polymerisation temp. on the configuration of the mol.

Paul W. Howerton

CA

Polarization-interferometer study of diffusion in liquids. V. N. Tsvetkov (Leningrad State Univ.). Zhur. Eksptl. Teoret. Fiz. 21, 701-10(1951).—The change of the refractive index n in the interdiffusion of 2 liquids of a differing by Δn is followed by placing the optical trough with the 2 liquids one above the other, in the path of a light beam polarized and split into 2 parallel beams, at a distance d from each other, by means of a quartz plate placed in front of the trough. The 2 beams pass above the boundary. An identical plate, placed behind the trough, reunites the 2 beams into one, and the interference is observed by means of a Nicol prism crossed with the polariser. The gradient, at a distance x from the boundary, is $dn/dx = \Delta n\sqrt{b/\pi}e^{-bx^2}$, with $b = 1/4Dt$, where D = diffusion coeff., and t = time. The path difference δ acquired over the thickness h of the trough is $\delta = (h/\lambda)(n_1 - n_2)$, where n_1 and n_2 correspond to layers distant by a. With x_0 designating the distance from the boundary to the layer lying midway between the 2 beams, then $\delta = (\Delta nh/\lambda)\sqrt{b/\pi}\int e^{-bx^2}dx$, the lower and upper limit of the integral being, resp., $x_0 - (a/2)$ and $x_0 + (a/2)$. The detn. of D consists in plotting δ as a function of (x_0/a), measuring the max. δ_m at $t = 0$ and at another $t > 0$, and calcg. h; from that, $D = 1/4bt$. An alternative procedure is measurement of the surface area under the curve $\delta(x_0)$. A convenient approx. formula, applicable at long times t (small b), is $\delta = Ae^{-Bx^2}$, with $A = (\Delta nac/\lambda)\sqrt{b/\pi}e^{-ba^2/12}$, and $B = b[1 - (ba^2/6)]$. The realm of this polarization-interferometer method is, particularly, the diffusion of polymer solns.; elimination of intermol. interaction effects calls for very high dilns. at which the usual refractometric methods become impractical. Examples of detns. of D in highly dil. soln. (against the pure solvent) for

low-mol. compds. are: sucrose 0.06% in H_2O, at 22°, $D = (4.78 \pm 0.08) \times 10^{-6}$ sq. cm./sec.; p-azoxyanisole 0.06% in C_6H_6, at 22°, $D = (1.31 \pm 0.07) \times 10^{-6}$; for high polymers, polydivinylstyrene ($M = 56,000$) 0.2% in C_6H_6, at 22.5°, $D = (2.8 \pm 0.16) \times 10^{-7}$; polydivinylstyrene ($M = 256,000$) 0.06% or 0.147% in $C_6H_4Cl_2$, at 20°, $D = (1.6 \pm 0.1) \times 10^{-7}$ (no variation with the concn.); polystyrene ($M = 700,000$) 0.1% in C_6H_6, at 22°, $D = (8.3 \pm 0.4) \times 10^{-8}$. The decrease of D with increasing mol. wt. M is unmistakable. However, D decreases much more slowly than M increases; this indicates that the polymer in soln. is not completely "permeable" to the solvent but possesses some degree of "opacity."
N. Thon

TSVETKOV, V. N.

E. V. Frisman and V. N. Tsvetkov. Dynamic double refraction of liquids with chain
molecules. P. 622.

The A. A. Zhdanov
Leningrad State University
Institute of Physics
April 19, 1950

SO: Journal of Physical Chemistry, Vol. XXV, No. 6, June 1951

TSVETKOV, V.

"Method for Determining the Geometrical Dimen-
sions of Macromolecules in Solution," V. Tsvetkov,
Inst of High-Mol Comps, Acad Sci USSR

Tsvetkov attempts to improve the familiar defi-
cient methods. He suggests sizes of mols in same
solvent be found by measuring const of progressive
diffusion D_t and const of rotational diffusion D_r,
as related by $D_t = kT/F$ and $D_r = kT/M$ (where k =
Boltzamann's const T = abs temp, F = coeff of pro-
gressive friction, and M = coeff of rotational
friction). Submitted by Acad A. A. Lebedev 19 Mar 51

186T106

TSVETKOV, V. N.

"Optical Methods of Studying the Mobility and Form of Macromolecules in Solution" (Opticheskiye metody izucheniya podvizhnosti i formy makromolekul v rastvore) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 380-390, Iz. AN SSSR, Moscow, 1956

(Report given at above Conference, Minsk, 21-4 Dec 53)

Author: Institute of High Molecular Compounds AS USSR

TSVETKOV, V. N.

184T110

USSR/Physics - Molecules, Size of   21 Jun 51

"Ramification and the Geometric Dimensions of Chain
Molecules in Solution," V. N. Tsvetkov, Inst of
High-Mol Compds, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXVIII, No 6, pp 1123-1126

Shows for branching structures the quantity $\overline{r^2}$ de-
pends essentially upon deg of ramification, where
$\overline{r^2}$ is the mean sq radius of mol. Cf. P. Debye,
"Jour Chem Phys" 14, 636, 1946; P. J. Flory, "Jour
Am Chem Soc" 63, 3083, 1941. Submitted 17 Apr 51
by Acad A. A. Lebedev.

184T110

CA

Concentration dependence of the rate of diffusion of polystyrene in solution. V. N. Tsvetkov and S. P. Krozer (Inst. Polymer Compds., Acad. Sci. U.S.S.R., Leningrad). *Doklady Akad. Nauk S.S.S.R.* **81**, 383–6(1951); cf. preceding abstr.—The diffusion of a polystyrene of mol. wt. $M = 635,000$ in soln. in C_6H_5Cl was measured at $21 \pm 0.005°$ by the polarization-interferometer method, between solns. differing in concn. by 0.03 g./cc., e.g., a 2.03 and a 2.00 g./cc. soln., or a 0.03 g./cc. soln. and the pure solvent. The interferometric measurements were evaluated by the methods of $b(z_0)$ surface area and of b_m (cf. preceding abstr.), and the diffusion coeffs. D detd. by the slopes of the rectilinear plots of $1/b$ as a function of the time t. The diffusion coeff. D increases with increasing concn. c, e.g., at $c = 0.03$–$0.07, 0.28, 0.53, 1.03, 2.03$ g./cc., $10^7 D = 1.0 (\pm 0.1), 1.2 (\pm 0.1), 1.4 (\pm 0.1), 1.0 (\pm 0.1), 2.3 (\pm 0.2)$ cm.^{2}/sec. Up to $c = 1$ g./cc., the increase of D is linear, $D = D_0 (1 + \alpha c)$, with $\alpha = 86$ cc./g. The increase of the mobility of the macromols. with the concn. is a direct demonstration of segmentwise motion of the polymer chains, and is related to the anomalous concn. dependence of the osmotic pressure I and of scattering of light by polymer solns. If one takes into account the deviation of polymer solns. from van't Hoff's law, and writes $\pi/c = (RT/M) + Bc$, where B is a const., Einstein's formula for D becomes $D = (kT/f)[1 + (2BMc/RT)]$, where $f =$ friction coeff. Data of Frisman and Kiseleva (*ibid.* **74**, 221(1950)) for the concn. dependence of scattering of light of the same polymer in CCl_4 soln. give $2BM/RT = 1000$ cc./g., very much higher than $\alpha = 86$). Such a discrepancy cannot be due to a difference of solvents, but is evidently linked to a concn. dependence of f. Inasmuch as the concn. dependence of D is detd. by both the hydrodynamic term kT/f and the kinetic term $2BMc/RT$, one can expect, depending on the particular polymer (or, for the same polymer, in different temp. ranges), either an increase or a decrease of D with the concn. Authentic values of the coeff. of translational diffusion of a polymer can be obtained only at lowest concns., not exceeding a few hundredths of a percent.　　N. Thon

5
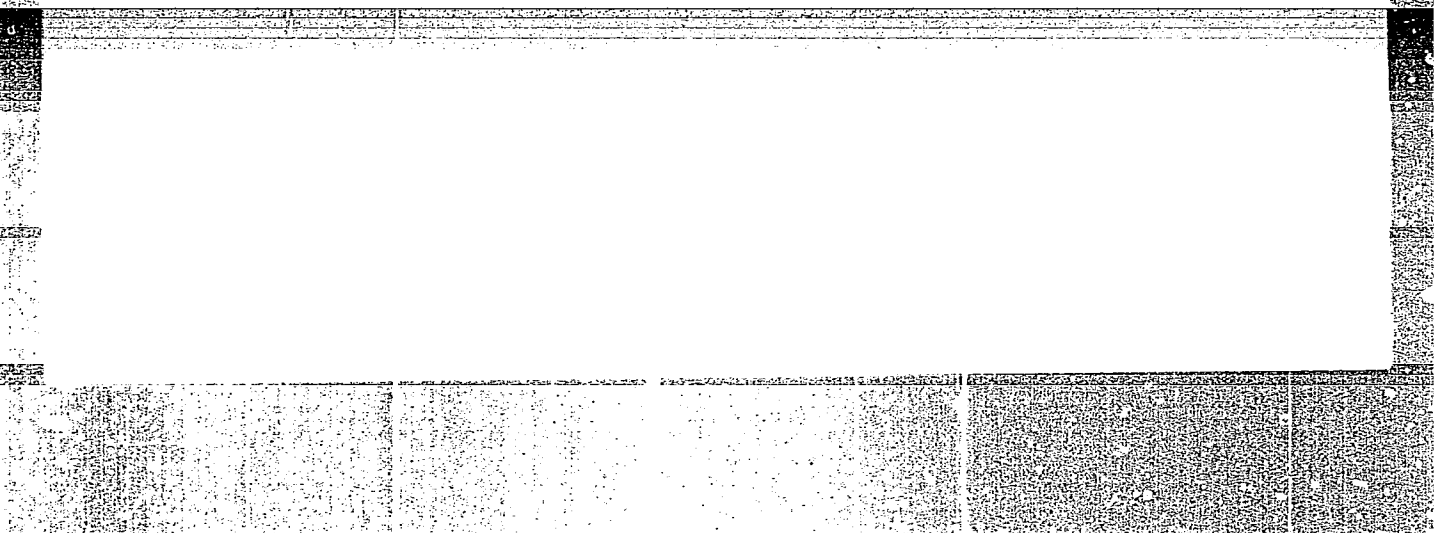
USSR ·   339.133 : 535.515

/675. Dynamic double refraction and the geometrical
dimensions of macromolecules in solution. E. V.
FRISMAN AND V. N. TSVETKOV. Zh. eksper. teor. Fiz.,
23, No. 6 (12) 690-702 (1952) In Russian.

The method of double refraction in a flow was used
to study the structure of macromolecules in solution.
A new universal type of dynamo-optimeter was
developed, the construction of which is such that it
is possible to obtain 'a laminar flow using an internal
and an external rotor. It was established experi-
mentally that the apparatus can be used for liquids of
low viscosity within a wide range of velocity gradients
under conditions of laminar flow. The dynamic
double refraction of solutions of polystyrene in
toluene and in butanone (methyl ethyl ketone) was
investigated. The coefficients of the rotational
diffusion of macromolecules were determined. The
radii, the degree of transparency and the degree of
coagulation of macromolecules in solution were
determined by a comparison of the data obtained with
the values of progressive diffusion for the same
solutions. The possibility was shown of determining
the molecular weight of a polymer from the measure-
ments of the orientation angle of the dynamic double
refraction of its solutions.   AB E. RABKIN

TSVETKOV, V.N., KROZER, S.P., and TEREMT'YEVA, L. S.

"Dependence on Concentration of the Velocity of Diffusion of Certain Polymers in Solution," Dokl. AN SSSR, 85, No.2, pp 313-6, 1952
Inst. of High Molecular Compounds, AS USSR

Results of investigation into the dependence, on concn, of the coefficient of diffusion of certain nonfractionated forms that differ considerably in molecular wts, e.g., polyisobutilene in hexane, polyvingl in water, etc. Presented by Acad A.N.Terenin 19 May 52.   252T90

(PA s6 no. 671:7499 s3)

TSVETKOV, V. N.   1 Jan 53

USSR/Physics - Polystyrene

Diffusion of Fractions of Polystyrene in Dichloroethane," V. N. Tsvetkov and S. I.

Klenin, Inst of High Mol Compds, Acad Sci USSR

DAN SSSR, Vol 88, No 1, pp 49-52

Investigate sample of polystyrene obtained by block polymerization of monomer at

temp of 60°. The sample was fractionated and mol wt of fractions computed (see

Outer, Carr, Zimm. J. Chem Phys, 18, 830 (1950)). Results showed that radii of

spheres hydrodynamically equivalent to mol globule are proportional to square roots

of mass of macromol, computed from light scattering. Received 16 Oct 52.

262T76

259T95

TSVETKOV, V. N.

USSR/Physics - Ultrasonic Absorption

21 Apr 53

"Absorption of Ultrasonic Waves in Certain Viscous Fluids," I.G. Mikhaylov

DAN SSSR, Vol 89, No 6, pp 991-993

Preliminary results of measurement of absorption of ultrasonic waves in refined cottonseed, tung, and castor oil, in which volumetric viscosity plays a small role. Acknowledges participation of V. S. Vasil'yeva and T.A. Kompaneyskaya in the work. Cites related works of V. N. Tsvetkov and V. Ye. Eskin (DAN SSSR, Vol 67, No 2, 1949), who investigated orientational relaxation in castor oil by method of acoustic birefringence. Presented by Acad A. N. Terenin 2 Feb 53.

259T95

TSVETKOV, V.N.; MAGARIK, S.Ya.

Dynamoöptimeter of high resolving power. Vest.Len.un. 9 no.8:163-168
Ag '54.
(Diffusion) (Molecular rotation)

(MIRA 8:7)

Tsvetkov, V. N.

Investigation of solutions of linear polymers by the light-dispersion method (Tyndall effect). I. General introduction. K. Z. Kattakhov, V. N. Tsvetkov, and O. V. Kallistov. Zhur. Eksptl. i Teoret. Fiz. 20, 315 (1951). Theoretical and math. The dimensions and masses of polymer mols. in solns. are detd. by a study of the asymmetry of the dispersion of light by the soln. and of the intensity of the dispersed light at an angle of 90° to the incident beam. Corrections of the measured asymmetry are made by correcting for the dispersion caused by the solvent itself. For the case of polydisperse samples, the mol. wts. as detd. by the light-dispersion method are mean mol. wts. II. Molecular weights and dimensions of molecules of polymethyl methacrylate in acetone solution Ibid. 351–61.—Exptl. studies of the asymmetry of the dispersion of light by solns. of polymethyl methacrylate fractions in acetone and in benzene were made over a wide range of mol. wts. M and concns. The 13 fractions studied yielded, by extrapolation to infinite diln., mol. wts. ranging from 0.07 to 6.35 × 10^6 in acetone and 0.25 to 7.85 × 10^5 in benzene. The formula $[\eta] = 0.408 \times 10^{-4} M^{0.77}$ gives the relation between the specific characteristic viscosity of a fraction of polymethyl methacrylate in benzene and M. The relation between the length of a polymer mol. in soln. and in the isolated state is $\bar{h}^2 = \bar{h_0}^2 \alpha^2$ where $\alpha^5 - \alpha^3 = 2C_0 A_2 V_1 d_2^2 M^{1/2}$, so that $\alpha = k M^{0.1}$. App. and cor'cd. relations are illustrated. V_1 is molar vol. of the solvent and d_2 is the d. of the polymer.

Franz H. Rathmann

USSR/Physics - Polymers

FD-1369

Card 1/1   : Pub. 146-14/18

Author   : Tsvetkov, V. N.; Fattakhov, K. Z.; and Kallistov, O. V.

Title   : Investigation of solutions of linear polymers by the method of light scattering. II
Molecular weights and dimensions of molecules of polymethyl metacrylate in acetone

Periodical   : Zhur. eksp. i teor. fiz., 26, 351-361, Mar 1954

Abstract   : The authors present the experimental investigations into light scattering by solutions containing fractions of polymethyl metacrylate in acetone for a wide range of molecular weights. For the studied fractions they determine the molecular weights and dimensions of the molecules. A formula is obtained which connects the characteristic viscosity of fractions of polymethyl metacrylate in benzol with their molecular weights. Thank E. S. Pisarenko for his help in fractioning and viscosimetric measurements. Seven references, 4 USSR (e.g. E. Frisman and K. Kiseleva; M. V. Vol'kenshteyn and O. B. Ptitsyn. 1951).

Institution   : Institute of High-Molecular Compounds, Academy of Sciences USSR

Submitted   : April 16, 1953

TSVETKOV, V. N.

USSR/Physical Chemistry

Card 1/1

Authors   :   Tsvetkov, V. N., and Terentyeva, L. S.

Title   :   Diffusion of polystyrene fractions in toluene

Periodical   :   Dokl. AN SSSR, 96, Ed. 2. 323 - 326, May 1954

Abstract   :   Study was made to determine the concentration relation of diffusion
                   of various polystyrene fractions in toluene. Molecular weights of
                   the fractions were determined from viscosimetric measurements in
                   toluene in accordance with formulas (4,5) for the characteristic
                   viscosity η:
                   $$[\eta] = 1.6 - 10^{-4} \cdot M^{0.69}$$
                   The obtained values η and M are given in table. The method of
                   measuring the rate of diffusion was no different from the one used by
                   other authors. Twelve references; 6 USSR since 1945. Table, graphs.

Institution   :   Academy of Sciences USSR, Institute of Highmolecular Compounds

Presented by   :   Academician A. A. Lebedev, March 4, 1954

Tsvetkov, V. N.,

Optical methods for investigating the structure of macromolecules in solution. V. N. Tsvetkov (Inst. vysokomolekulyarnich hitek, Akad. Nauk S.S.S.R., Leningrad). Chem. Listy 49, 1410-32(1955).—A lecture. Exptl. and theoretical work by T. on the structure and phys. properties of macromols. (diffusion coeffs., flow birefringence) is reviewed and discussed. The exp'l. results agree better with the theory of anisotropic spheres than with the theory of viscoelastic spheres.   E. Erdös

TSYETKOV, V.N.

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61705

Author: Tsvetkov, V. N., Savvon, S. M.

Institution: None

Title: Dynamic Double Refraction in Solutions of Fractions of High-Molecular Polystyrene

Original
Periodical: Zh. tekhn. fiziki, 1956, 26, No 2, 348-358

Abstract: By means of the universal dynamo-optimeter an investigation was made of dynamic double refraction of solutions of polystyrene (I) fractions, in benzene, over tne molecular weight M interval from one to 5×10^6. The results thus obtained are in full agreement with the previously secured data (Referat Zhur - Khimiya, 1956, 16288) relating to toluene solutions of I having lower M. Characteristic values (with zero gradients and concentrations) of angles of orientation and double refraction increase monotonously with M of the samples in quantitative agreement with the orientation theory of Maxwell's effect.

Card 1/1

TSVETKOV, V. N.

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61704

Author: Frisman, E. V., Tsvetkov, V. N.

Institution: None

Title: Deformation of Macromolecules in Flow and Its Influence Upon the Sign of Dynamic Double Refraction of the Polymer Solution

Original
Periodical: Dokl. AN SSSR, 1956, 106, No 1, 42-45

Abstract: From the theory of the effect of shape in dynamic double refraction of solutions of polymers, previously proposed by the authors (Referat Zhur - Khimiya, 1955, 39899), it follows that the role of this effect increases with molecular weight M of the polymer. Therefore in a solution of polystyrene (I), for which the internal anisotropy is negative and the shape anisotropy is positive, the sign of dynamic double refraction Δn can depend on M. To verify this an investigation was made of dynamic double refraction of the solutions of 2 fractions I (M $\approx 3 \cdot 10^5$ and $8 \cdot 10^6$) in dioxane (difference

Card 1/2

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61704

Abstract: in the refraction indexes of dry I and of the solvent is 0.18). With the first fraction Δn increases linearly with increase in velocity gradient g and has a negative sign. With the second fraction Δn is positive and increases in proportion to g when g is small, but on further increase in g the Δn passes through a maximum and then becomes negative. The authors attribute the change in sign of Δn to the occurrence of a negative photo-elastic effect, the role of which incr■ses with increase in g. With small g the essential part is played by the shape effect which indicates an asymmetry in the shape of macromolecule. The ratio of dynamo-optical constant Δ■ to characteristic viscosity $[\eta]$ depends sharply upon M: for the 2 fractions $[n]/[\eta]$ is respectively $-1.86 \cdot 10^{-10}$ and $+23 \cdot 10^{-10}$.

Card 2/2

TSVETKOV, V.N.; SAVVON, S.M.

Dynamic birefringence in solutions of high-molecular polystyrene fractions. Zhur.tekh.fiz.26 no.2:348-358 F '56.   (MLRA 9:6)

(Styrene--Optical properties)

TSVETKOV, V.N.; KOTLYAR, S.Ya.

Investigation of polyvinyl acetate solutions by the light scattering
method [with English summary in insert]. Zhur.fiz.khim.30 no.5:1100-
1103 My '56.   (MIRA 9:9)

1.Akademiya nauk SSSR, Institut vysokomolekulyarnykh soyedineniy,
Leningrad.
(Light--Scattering) (Acetic acid)

Tsvetkov, V. N.

USSR/ Physics - Optics

Card   1/1   Pub. 22 - 11/48

Authors   : Frisman, E. V. and Tsvetkov, V. N.

Title   : Deformation of macromolecules in a flow and its influence on the sign of the dynamic birefringence of a polymer solution

Periodical : Dok. AN SSSR 106/1, 42-45, Jan 1, 1956

Abstract   : A new hypothesis concerning the birefringence of polymer solutions is expressed. It indicates, that the optical behavior of a macromolecule of a polymer solution depends not only on the natural anisotropy of the molecule, as it has been stated by the statistical theory, but also on the anisotropy of the molecule's shape. Experiments, conducted for the purpose of proving the correctness of the hypothesis, are described. Thirteen references: 5 USSR, 5 Germ., 1 USA and 2 Swiss (1873-1955). Graphs.

Institution : Leningrad State University imeni A. A. Zhdanov

Presented by: Academician A. A. Lebedev, August 9, 1955

TSVETKOV, V. N., and KALISTOV, O. V.

"Viscosity dependence on shear rate," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan.-2 Feb 57, Moscow, Polymer Research Inst.

B-3,004,395

TSVETKOV, V. N., Leningrad State University

"A Study of the Diffusion in Polymer Solutions by the Use of the Polarization Interferometer," a paper submitted at the International Symposium on Macromolecular Chemistry, 9-15 Sep 1957, Prague.

TSVETKOV, V. H., KALISTOV, O. V., ALDOSHIH, V. G., and ESKIN, V. E.

"Some problems in the light scattering of solutions," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan-2 Feb 57, Moscow, Polymer Research Inst.

B-3,084,395

TSVETKOV, V.N.

Modern methods of determining the form of macromolecules in solutions.
Usp. khim. i tekh. polim. no.2:171-190 '57.   (MIRA 11:1)
        (Solutions (Chemistry))   (Macromolecular compounds)
                        (Molecular structure)

20-5-17/54

AUTHORS: Tsvetkov, V. N.,   Magarik, S. Ya.

TITLE: The Optical Anisotropy of Some Chain-Like Molecules
                Which Contain Benzene Rings (Opticheskaya anizotropiya
                nekotorykh tsepnykh molekul, soderzhashchikh benzol'nyye
                kol'tsa).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 5,
                pp. 911-914 (USSR)

ABSTRACT: The difference of polarizability of a monomeric term
                (in the direction of the chain of the main valences
                and in the direction opposite to it) with respect to the
                sign agrees with the anisotropy of the segment. The
                present paper makes use of this fact for the comparative
                study of the structure of the polymeric chains which
                contain benzene rings. The following 4 polymers were
                investigated: polystirol (P_1), poly-n-tetra-butyl-
                phenylmetacrylate (P_2), poly-1,4-diisopropenyl-benzene
                (P_3) and diisopropenyldiphenylethane (P_4). All these
                polymers were not fractionated. For the purpose of
                determining both main polarizabilities α_1 and α_2 of a

CARD 1/3

The Optical Anisotropy of Some Chain-Like Molecules   20-5-17/54
Which Contain Benzene Rings

segment of the chain dynamo-optical and viscosimetrical measurements were undertaken on the polymers in such solvents as exclude the form effect. Chlorine benzene was used as a solvent for P_2 and "bromoform" for the three other polymers. The dynamical double refraction of rays was investigated in a dynamometer with an internal rotor. The dependence of the double ray refraction upon the velocity gradients determined in this way is here shown in figures for the mentioned polymers. The difference $(\alpha_1-\alpha_2)$ is a large positive quantity for P_3 and P_4 and for P_1 and P_2 a large negative quantity. On the basis of a structural scheme given here the anisotropy of the monomer term can be computed in the investigated polymers. The corresponding results are given in a table. The differences of the polarizabilities of the terms of the chain $\beta_1 - \beta_2$ found here have the same sign in all cases as that of the experimental values of $\alpha_1 - \alpha_2$ and they

CARD 2/3   also have reasonable absolute values. There are 4 figures,

The Optical Anisotropy of Some Chain-like Molecules   20-5-17/54
Which Contain Benzene Rings

        1 table and 7 references, 3 of which are Slavic.

PRESENTED: By A. A. Lebedev, Academician, February 19, 1957

SUBMITTED: February 19, 1957

AVAILABLE: Library of Congress

CARD 3/3

FRISMAN, E. V. and TSVETKOV, V. H.

(The Physical Instiutute of the University of Leningrad, Leningrad, USSR)

"The Effect of Shape in Streaming Birefringence of Polymer Solutions," paper submitted at Soviet High-Polymers, Intl. Conference, Nottingham, Uk, 21-24 July 1958.

E-3,109,661

AUTHORS: Tsvetkov, V. N., Aleksandrova, Ye. M.   SOV/64-58-5-5/21

TITLE: The Coagulation of Polystyrene Latex in Mechanical Mixing
             (Koagulyatsiya polistirol'nogo lateksa pri mekhanicheskom
             peremeshivanii)

PERIODICAL: Khimicheskaya promyshlennost', 1958, Nr 5, pp.280 - 284 (USSR)

ABSTRACT: From the study of the rheological properties of gels in
             castor-oil soap as a stabilizer in polystyrene latex the
             possibility of an electrolyte-less coagulation by mechanical
             destruction of the stabilizer's adsorption layers on the solid
             latex particles was assumed. Since Peskov (Ref 8) had already
             mentioned coagulation investigations without electrolyte
             effect the authors of the present article carried out experiments
             with different amounts of castor-oil soaps (castor-oil soaps
             KM), with 0,4 to 1,2 parts by weight being used for the stabili-
             zation, and with the latex being correspondingly termed KM-0,4
             KM-1,2 etc. An apparatus with a plane disk mixer was used and
             the end of coagulation was determined according to the viscosity
             of the latex. According to Maron and Bowler (Maron i Bowler)
             (Ref 9) a heated latex needs more electrolyte for the coagulation

Card 1/3

The Coagulation of Polystyrene Latex in Mechanical   SOV/64-58-5-5/21
Mixing

than one which is not heated; the latex KM-1,2 showed a
maximum stability at 8-12°. In connection with the observations
made by Freundlich (Freyndlikh)(Ref 10) and Müller (Myuller)
(Ref 11) the authors carried out experiments on various in-
fluences on the coagulation of latex and stated that an in-
crease of the latex concentration as well as of the rotational
speed of the stirrer increase the rate of coagulation so that
in the formation of the polymer a partial coagulation begins.
It was found that the addition of a polymer coagulate in the
coagulation process exerts an autocatalytic effect on the
course of coagulation. The experimental results in the inves-
tigation of the relative resistances of the adsorption layer
with the addition of a stabilizer and a subsequent mechanical
coagulation were in agreement with those obtained by Rebinder
and Trapeznikov (Ref 13), as Heller (Geller)(Ref 14), and
Yurzhenko and Gusyakov(Ref 15). According to their resistance
the anions may be arranged in the following order: sodium
oleate〉 sodium stearate〉 n-octylnaphthalene-sulfo acid-sodium〉sodium
ricinoleate.   There are 8 figures and 16 references, 9 of
which are Soviet.

Card 2/3

TSVETKOV, V. N.; LIPATOV, S. M.; KARGIN, V. A.;

"Polymers, their solutions and semi-colloids."

report presented at the Fourth All-Union Conference on Colloidal Chemistry, Tbilisi, Georgian SSR, 12-16 May 1958 (Koll zhur, 20,5, p.677-9, '58, Taubman, A.B)

TSVETKOV, V. L.

AUTHORS: Tsvetkov, V. L., Verkhotina, L. M.   97-1-1./5:

TITLE: Photoelastic Effect in Methylmethacrylate and Poly-p-Tertiary
             Butylphenylmethacrylate Polymers and Their Copolymers (Foto-
             elasticheskij effekt v polimerakh metilmetakrilata, poli-p-tre-
             tichnogo-butilfenilmetakrilata i v ikh sopolimerakh).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 1, pp. 97-108
             (USSR)

ABSTRACT: The elasticity of the side groups of the macromolecule was in-
             vestigated by means of an object which has the structure of the
             basic chain (similar to the structure of the poly-methyl-metha-
             crylate=PMMA) but which has an essentially heavier and much more
             anisotropic ather group than the COOCH$_3$ group of the methyl-
             methacrylate. As this object poly-p-tertiary butylphenylmethacry-
             late (PPTBPMA) was chosen. It has a side ather group with the
             COOC$_6$H$_4$C(CH$_3$)$_3$-structure. The thermal resistant samples of the
             PPTBPMA and of its polymers were obtained from the laboratory of
             Professor M. M. Koton at the Institute for High-Molecular Compounds.
             The temperature course of the photoelastic effect of PMMA as well
             as of PPTBPMA, and of their copolymers were investigated. The
             temperature dependence £ of PMMA corresponded with that earlier
             observed. Immediately above the vitrification temperature the ef-
             fect is negative, changes its sign and becomes positive at high
             temperatures. PPTBPMA shows, in pure form as well as in form of co-

Card 1/2

Photoelastic Effect in Methylmethacrylate and Poly-p-Tertiary   57-1-16/50
Butylphenylmethacrylate Polymers and Their Copolymers.

polymers in highly elastic state a photoelastic effect. The calculation of the polarisability difference for the segment $a_1 - a_2$ of PPTBPMA according to the additive property scheme for the components leads to $a_1 - a_2$ values which are close to those of pure polymers; a_1 and a_2 are the polarisabilities of the static segment of the molecular chain in the direction of its length, resp. in the direction vertical to it. Using the known data on the polarisability the main polarisability of the monomeric members of PMA and PPTBPMA for a flat model of the basic chain and under different conditions for the elasticity of the side chains is calculated. The authors show that the positive photo-elastic effect in PMA can only be understood if a practically complete freedom of rotation around the C-O- and C-O- connections in the ester group are assumed. On the other hand the negative double ray difraction in PPTBPMA shows that in its molecule these rotations are practically slowed down. This can be attributed to the interaction of the substituents in the carbon atoms separated by the heavy methylen group. There are 11 figures, 3 tables, and 5 references, 6 of which are Slavic.

ASSOCIATION: Institute for High-molecular Compounds AS USSR, Leningrad (Institut vysokomolekulyarnykh soyedineniy AN SSSR, Leningrad).

SUBMITTED: February 23, 1957
AVAILABLE: Library of Congress
Card 2/2

57-28-5-18/36

AUTHORS: Tsvetkov, V. N., Klenin, S. I.

TITLE: Diffusion and Viscosity of Solutions of Polymethylmetacrylate and of Polyparatertiary Butylphenylmetacrylate (Diffuziya i vyazkost' rastvorov polimetilmetakrilata i poliparatretichnogo butilfenilmetakrilata)

PERIODICAL: Zhurnal Tekhnichskoy Fiziki, 1958, Vol. 28, Nr 5, pp. 1019--1028 (USSR)

ABSTRACT: The diffusion velocity of polymers in diluted solution represents one of the immediate characteristics of its molecular size. Therefore it is possible to pass a judgement on the structure of its macromolecules from the determination of the diffusion coefficient of the polymer in the solution. In the present paper the authors applied this method to the comparative examination of the properties of polymethylmetacrylate (PMMA) and of polyparatertiary butylphenylmetacrylate (PBPHMA). These compounds represent polymers with identical chain structure of the basic valence, however, with a different size and structure of the molecular side groups. The dependence of the characteristic viscosities[η] and of the diffusion coefficients D on the molecular weight of the fraction was given for two

Card 1/4

Diffusion and Viscosity of Solutions of Polymethylmetacrylate   57-28-5-18/36
and of Polyparatertiary Butylphenylmetacrylate

investigated polymers in a logarithmic scale (figures 9 and
10). These points coincide with the straight lines correspond-
ing to the following functions. For PMMA in chloroform holds:

$$[\eta] = 5.1.10^{-5} . M^{0.79} \qquad D = 4.5.10^{-4} M^{-0.60}$$

and for PBPHMA in chloroform

$$= 2.4.1.^{-5} M^{0.78} \qquad D = 6.0.10^{-4} M^{-0.60}$$

As is known, a universal interrelation exists between the
diffusion coefficient D and the characteristic viscosity $[\eta]$
of the polymer fraction in the corresponding solvent,(Refs 8
and 9). If the hydrodynamical properties of the molecular
tangle in the solution is ascribed by means of equivalent,
semi-transparent spheres, as it is done in the theory by De-
bye-Bueche (Ref 13), the ratio between the hydrodynamical mo-
lecular radius from the viscosity R_η and the radius from
diffusion R_D is

$$\frac{R_\eta}{R_D} = \frac{6\pi}{k} \left(\frac{30}{\pi N}\right)^{1/3} \left\{\eta_0 D (M[\eta])^{1/3} T^{-1}\right\}^{\nu} (\sigma) \left(\frac{2.5}{\varphi(\sigma)}\right)^{1/3}$$

Card 2/4   Hence, the quantity $A = \eta_0 DT^{-1}(M[\eta])^{1/3}$ differs from the ratio

Diffusion and Viscosity of Solutions of Polymothylmetacrylate   57-28-5-18/36
and of Polyparatertiary Butylphenylmetacrylate

$\frac{R\eta}{R_D}$ only by the numerical multiplicand. The theory by Flori
shows analoguous results (Ref 14). Experiments show that the
quantity A proportional to the ratio $R\eta/R_D$ represents a uni-
versal constant, its most probable value being $A=3.44 \cdot 10^{-10}$
$\frac{erg}{grad}$. The proportion of the viscosity- and hydrodynamic diffus-
ion radii permits to immediately obtain the interrelation bet-
ween the |—| size of the macromolecules and the diffusion co-
efficient. Summary: In this paper a device for the measurement
of the diffusion coefficient in solutions is described. It is
based upon the application of the polarization interferometer!
The diffusion and the viscosity of the solutions of polymethyl-
metacrylate and of polybutylphenylmetacrylate in the wide in-
terval of the molecular balance was investigated. A simple re-
lation was obtained, which permits to determine the size of the
macromolecules in the solution according to the measured diffus-
ion coefficients. The experimental results permit to conclude
that rotation in the chains of polybutylphenylmetacrylate is mo-
re impeded than is the case in the chains of polymethylmetacry-
late. There are 13 figures, 3 tables, and 14 references, 1o of
which are Soviet.

Card 3/4

Diffusion and Viscosity of Solutions of Polymethylmetacrylate 57-28-5-18/36
and of Polyparatertiary Butylphenylmetacrylate.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR, Leningrad
               (Leningrad, Institute for High-Molecular Compounds, AS USSR)

SUBMITTED: July 23, 1957

               1. Polymers—Diffusion   2. Polymers—Viscosity

Card 4/4

307/ 57-2-7-11/35

AUTHORS: Tsvetkov, V. N., Frisman, E. V., Ptitsyn, O. B.,
Kotlyar, S. Ya.

TITLE: The Shape Effect in the Dynamic Double Refraction of Polymer Solutions (Effekt formy v dinamicheskom dvoynom lucheprelomlenii rastvorov polimerov)

ABSTRACT: The authors suggest a theory of the shape effect in the dynamic double refraction of polymer solutions. The taking into account of the shape effect in the theory of dynamic double refraction is suggested on the basis of the model by Tsvetkov and Frisman (Ref 9). According to this model the macromolecule in a solution is regarded as an ellipsoidal macroscopic particle saturated with the solvent. The refraction index of such a particle is different from the refraction index of the solvent. Thus the particle does not only have an intrinsic anisotropy but also an anisotropy of shape. The latter can be calculated according to the known formula by Maxwell (Refs 10 and 11) concerning the anisotropy of the

Card 1/3

SOV/57-28-7-11/35

The Shape Effect in the Dynamic Double Refraction of Polymer Solutions

shape of macroscopic particles. It is shown that in the case of small velocity gradients the shape effect increases proportionally to the gradient, while in the case of great gradients it tends toward a constant value. The theory given expresses well the experimental data and in particular case; also the earlier-found dependence of the sign of the double refraction of a solution of polystyrene in dioxane on the velocity gradient. Finally the authors refer to the works by M. Čopič (Refs 17 and 18) and they show that in spite of the great difference in the models used and in spite of a number of assumptions in either theory they coincide well (viz. this theory and that by Čopič). There are 2 figures, 2 tables, and 18 references, 8 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High Molecular Compounds, AS USSR) Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova (Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: May 11, 1957
Card 2/3

The Shape Effect in the Dynamic Double
Refraction of Polymer Solutions

SOV/57-28-7-11/35

1. Polymer solutions--Refraction

Card 3/3

SOV/57-28-7-14/35

AUTHORS: Tsvetkov, V. N., Krozer, S. P.

TITLE: On Some Pre-Transition Phenomena in p-Azoxyanisole Near the
             Point of Transformation (O nekotorykh predperekhodnykh
             yavleniyakh v p-azoksianizole vblizi tochki prevrashcheniya)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 7, pp. 1444-1447
             (USSR)

ABSTRACT: In connection with the strong double refraction in the iso-
             tropic phase of the flow the presence of an anomalous effect
             in the ultrasonic field was to be expected, as the double
             acoustic refraction in the liquid can be regarded as a dyna-
             mo-optical effect with a velocity gradient dependent on
             time. The experimental checking of the theoretical conclusions
             was carried out (Refs 9 and 12). The effect mentioned was
             found and investigated by the authors. Besides, the authors
             observed an anomalously strong absorption of ultrasound (all
             experiments were carried out from 1948 - 1950). For the in-
             vestigation of this phenomenon an apparatus with a generator
             using a [K 1000 valve operating in a three-point circuit

Card 1/3

SOV/57-23-7-14/35

On Some Pre-Transition Phenomena in p-Azoxyanisole Near the Point of Trans-
formation

was constructed. The description of the apparatus and of
the experiment follow. From the data obtained this way the
absorption factor was then determined according to formula (2).
The magnitude B is proportional to the constant of double
refraction k_s and was determined according to formula (3).
Furthermore, follows

$$B \sim M \frac{1}{1 + \omega^2 \tau^2} ;$$

where M denotes the Maxwell constant, ω the angular fre-
quency and τ the relaxation time. The intensity of ultra-
sound I at the place where a double refraction was observed
was determined according to formula (2). From the last-men-
tioned formula the relaxation time can be determined. The re-
sults obtained this way are similar to the results of the
measurement of ultrasound absorption (Ref 13). The experi-
ment discussed does not permit to find the exact temperature
dependence at τ. Nevertheless the following may be assumed:
The relaxation phenomena observed in absorption and double
refraction are of similar nature. It would be natural to
assume that the relaxation time was proportional to the
particle volume. A comparison of the results (Ref 4) with

Card 2/3

On Some Pre-Transition Phenomena in p-Azoxyanisole Near the Point of Trans-
formation

SOV/57-23-7-14/35

> the curve obtained by this experiment shows a good coincidence
> which again points to the similar character of the mechan-
> isms. There are 3 figures, 1 table, and 15 references, 8 of
> which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo uni-
versiteta im. A. A. Zhdanova
(Institute of Physics at the Leningrad State University
imeni A. A. Zhdanov)

SUBMITTED: April 29, 1957

1. Cyclic compounds--Acoustic properties   2. Ultrasonic radiation
--Absorption

Card 3/3

V.N. Isvern...

SOV/62-59-3-36/37

S(O)/
AUTHOR: Bose-Oliva

TITLE: General Meetings of the Department of Chemical Sciences of the Academy of Sciences, USSR on October 23 and November 27-28, 1958 (Obshchiye sobraniya Otdeleniya khimicheskikh nauk Akademii nauk SSSR 23 oktyabrya i 27-28 noyabrya 1958 g.)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye khimicheskikh nauk, 1959, Nr 3, pp 564-566 (USSR)

ABSTRACT: This is a report on the General Meetings of the Department of Chemical Sciences, AS USSR. On October 23, 1958 the General Meeting of the Department of Chemical Sciences of the AS USSR took place under the chairmanship of Academician N. N. Semenov. A. V. Novoselova delivered a lecture on the "Investigations in the field of Tellurium Chemistry". She emphasized the fact that the interest in tellurium has considerably increased in the course of the last years because of the valuable semiconductor properties of tellurium and numerous tellurides. In her lecture Novoselova reported on the production of pure tellurium, on the investigation of the behavior of admixtures and on investigations of numerous tellurides. The lecturer answered numerous questions. M. A. Poray-Koshits, Candidate of Physical and Mathematical Sciences spoke on the "Stereochemistry of Complex Compounds of Bivalent Nickel". On the basis of direct X-ray structural analyses carried out at the Institut obshchey i neorganicheskoy khimii AN SSSR (Institute of General and Inorganic Chemistry, AS USSR) and the MGU it was found that all ammonia thiocyanate compounds of nickel which are separated from the solution at different concentrations represent, according to their structural character, complex six-coordination compounds. The analysis of the crystalline structures makes it possible to set up common crystallochemical rules in the series of ammonia thiocyanate compounds. G. B. Bokiy and S. Z. Roginskiy, Corresponding Member, AS USSR, took part in the discussion. M. G. Gonikberg, Doctor of Chemical Sciences spoke on the "Application of High Pressure in the Investigation of the Transition Stage and the Mechanism of Reaction". By means of experimental data the lecturer proved that the application of high pressure opens new prospects in this field. S. Z. Roginskiy, B. V. Deryagin, Corresponding Members, AS USSR, M. I. Temkin and A. I. Kitaygorodskiy, Doctors of Chemical Sciences took part in the discussion. On the occasion of the general meeting held under the chairmanship of Academician A. P. Vinogradov from November 27 to 28, 1958 M. I. Nikitin, Corresponding Member, AS USSR and G. A. Razuvayevskiy, Candidate of Technical Sciences spoke on the "Properties of Low-substituted Cellulose Nitrates and Their Solutions". The following scientists took part in the discussion: S. N. Danilov, Corresponding Member, O. P. Golova, Doctor of Chemical Sciences, et al. N. N. Semenov, Doctor of Chemical Sciences spoke on the "Specific Sorption of Ions of Organic Substances". The synthesis of weakly swelling ion-exchange resins, which cannot absorb certain ions of organic substances allow the establishment of a new effective method of producing chemically pure streptomycin and penicillin. The lecturer was asked many questions. M. M. Vol'kenshteyn, Doctor of Physical and Mathematical Sciences dealt with the "Problems of Statistical Physics of the Polymer Chains". The lecturer and his collaborators have developed a general statistical method of computing the properties of macromolecules which is based on the application of the rotational isomer model. The following scientists took part in the discussion: V. I. Ivanov, Doctor of Chemical Sciences B. V. Deryagin and V. G. Levich, Corresponding Member, AS USSR. I. M. Frenkel, Doctor of Physical and Mathematical Sciences spoke on the "Intermolecular Interaction and the Form of Macromolecules in Solutions". The lecturer demonstrated that the molecular weight of the fraction may be determined by a joint determination of the character, intrinsic viscosity and diffusion. B. V. Deryagin, Corresponding Member, AS USSR, M. V. Vol'kenshteyn, Doctor of Physical and Mathematical Sciences and A. I. Kitaygorodskiy, Doctor of Chemical Sciences took part in the discussion.

Card 1/4

Card 2/4

Card 3/4

Card 4/4

ALEKSANDROVA, Ye. M.; TSVETKOV, V. N.; RAZUMIKHINA, N. S.

"Concerning Non-Electrolytic Coagulation of Polystirole Latexes."

report presented at the Section on Colloid Chemistry, VIII Mendeleyev Conference of General and Applied Chemistry, Moscow, 16-23 March 1959.
(Koll. Zhur. v. 21, No. 4, pp. 509-511)

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S/081/60/000/019/005/012
A006/A001

15.7140   2105,2209,1460

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 19, pp. 515-516,
79330

AUTHORS: Kamenskiy, I. V., Tsvetkov, V. N.

TITLE: Interaction of Phenol With Hexamethylene Tetramine. Information 2.
Preparation of Hexaphenol Resins in Aqueous and Aqueous-Alcoholic
Media   15

PERIODICAL: Tr. Mosk. khim-tekhnol. in-ta im. D. I. Mendeleyeva, 1959, No. 29,
pp. 55-62

TEXT: The authors investigated the reaction of phenol (I) with hexamethyle-
ne tetramine (II) in a liquid medium. Resins were investigated, obtained at a
different content of water in the initial mixture of I and II used at a 1 : 0.3
ratio. Optimum amount of water was 100 % with respect to I. The duration of
resin formation is 29 - 30 min depending on the amount of water introduced, the
Ubbelohde drop point is 111°C, hardening rate at 160°C is 87 sec, the content of
nitrogen bound is 5%. Resins are described obtained in the presence of 0.1 - 3%
KOH with respect to I. They are soluble in acetone, dioxane and alkalis and not

Card 1/2

85815

S/081/60/000/019/005/012
A006/A001

Interaction of Phenol With Hexamethylene Tetramine. Information 2. Preparation of Hexaphenol Resins in Aqueous and Aqueous-Alcoholic Media

soluble in alcohol and aniline. Changes in the nitrogen content in resins during the process of their hardening are shown. To obtain resins soluble in alcohol, condensation of I with II in aqueous-alcoholic medium is performed. At 100% alcohol with respect to I the yield is 142 - 144% (with respect to I) hardening rate at 160°C is 100 sec, the content of nitrogen bound is 4.58%. The resins are soluble in 50% KOH solution, aniline, acetone and alcohol. Information I see RZhKhim, 1958, No. 10, # 34994.

Ye. Zambrovskaya

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

FRISMAN, E.V.; TSVETKOV, V.N.

Dynamic birefringence due to the shape of macromolecules in
solution at different concentrations and shear stresses. Part 3.
Zhur.tekh.fiz. 29 no.2:212-223 F '59.   (MIRA 12:4)

1. Leningradskiy gosudarstvennyy universitet im. A.A.Zhdanova.
               (Styrene--Optical properties)

5(4)

AUTHORS: Tsvetkov, V. N., Kallistov, O. V.

TITLE: Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-butyl-phenyl Methacrylate in Acetone (Svetorasseyaniye i vyazkost' rastvorov fraktsiy polipara-tretichnobutilfenilmetakrilata v atsetone)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 3, pp 710-716 (USSR)

ABSTRACT: In the present case poly-para-tert-butyl-phenyl methacrylate (II) (Ref 2) was investigated by a method which was already applied to the determination of the size of macromolecules of polymethyl methacrylate (I) in acetone. The nephelometric measurements were made by means of a Pulfrich F device (Fig 1), while the viscosity was determined by means of a viscosimeter according to Oswald. The four sample fractions of (II) were obtained from acetone solutions by precipitation with methanol. From the diagram of Δn as a function of concentration c (Fig 2) (where Δn denotes the refractive indices of the solution and the solvent) the value $H = 2.28 \cdot 10^{-7}$ was computed and diagrams of various functions

Card 1/3

SOV/76-33-3-32/41

Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-
butyl-phenyl Methacrylate in Acetone

$(Hc/R''_{90}, 1/(Z-1), \eta_{spec}/c)$ of the concentration of the low- and
high-molecular fractions of (II) are given (Figs 3-7). According
to the data obtained a diagram of $\lg[\eta]$ as a function of $\lg \overline{M}_B$
(where $\overline{M}_B$ denotes the average molecular weight) (Fig 8) and
equation (4) were established, wherefrom the distribution curve
of the molecular weight was plotted (Fig 9). The latter exhibits
three maxima. From the thermodynamic point of view, acetone is a
better solvent for (I) than for (II). The dependence of the radii

of gyration of macromolecules $\sqrt{\overline{r_z^{-2}}}$ on the square root of the

polarization degree $\sqrt{P}$ for the fractions of (I) and (II) is
shown in figure 10. The authors state that with the same degree
of polarization of (I) and (II) the dimensions of the macro-
molecules of (II) in acetone are larger than in the case of (I).
The experimental results indicate a higher thermodynamic degree
of the mobility of "undisturbed" molecule chains of (I), as com-
pared to those of (II). The authors point to an interaction

Card 2/3

SOV/76-33-3-32/41

Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-butyl-phenyl Methacrylate in Acetone

of the substituents on nonadjacent hydrocarbon atoms of the chain, which are separated by a methylene bond and usually are not taken into account in the statistical theory of polymer chains. There are 10 figures, 1 table, and 8 references, 5 of which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut vysomolekulyarnykh soyedineniy, Leningrad (Academy of Sciences USSR, Institute of High-molecular Compounds, Leningrad)

SUBMITTED: September 6, 1957

Card 3/3

30V/76-33-4-13/32

5(4), 15(8)
AUTHORS: Magarik, S. Ya.,   Tsvetkov, V. N.

TITLE: The Optical Anisotropy of Polymethylmethacrylate, Poly-para-
               tert-butylphenylmethacrylate and Their Copolymers (Opticheskaya
               anizotropiya polimetilmetakrilata, poli-p-tret-butilfenil-
               metakrilata i ikh sopolimerov)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 4,   pp 835-839
               (USSR)

ABSTRACT: In the present paper the method of dynamic double refraction of
               light in a flowing polymer solution is applied to the investiga-
               tion of the optical anisotropy of the macromolecules. Poly-
               methylmethacrylate (I) and poly-para-tert-butylphenylmethacrylate
               (II) were subjected to comparative determinations since they
               differ from one another only by their dimension and the aniso-
               tropy of the lateral ester groups. Benzene was used as solvent
               for (I) and according to measurements made by S. I. Klenin (by
               means of a polarization interferometer) the difference of the
               refraction indices between the solvent and the solution per
               concentration unit $(n_1-n_2)/C = 6.10^{-5}$. (II) and its copolymers
               with (I) was investigated in chlorobenzene. The double refrac-
               tion of light was investigated in a universal "dynamooptimeter"
               (Ref 3). The anisotropy of (I) is independent of the molecular
               weight in 5 different fractions with a 100-fold change of the

Card 1/2

SOV/76-33-4-13/32

The Optical Anisotropy of Polymethylmethacrylate, Poly-para-tert-butylphenyl-methacrylate and Their Copolymers

molecular weight (Table) and is $(\alpha_1-\alpha_2) = +3.9 \cdot 10^{-25} cm^3$ which is a low value as compared e.g. with that of polystyrene. The results of parallel investigations of dynamo-optical and photoelastic properties of the polymers are compared and it is found that in (I) the transition from the vitreous into the highly elastic state does not take place sharply (as is the case in many polymers) but slowly within a larger temperature range. In the case of (I) it may be assumed that a complete freedom of rotation exists around the bonds C-C and C-O in the lateral ester groups of the macromolecules. In the case of (II) a free rotation for the benzene ring and around the C-C bond was observed; the rotation around the C-O bond, however, is considerably inhibited. The latter is explained by the interaction of the heavy substituents (with aromatic cycle and the butyl group) at the end of the lateral groups. In conclusion M. G. Zhenevskaya is thanked for the preparation of the samples. There are 4 figures, 1 table, and 13 references, 10 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy, Leningrad
(Institute of High-molecular Compounds, Leningrad)
SUBMITTED: September 18, 1957
Card 2/2

KAMENSKIY, I. V.; TSVETKOV, V. N.

Reaction between phenol and hexamethylenetetramine. Trudy MKHTI
no.29:55-62 '59.   (MIRA 13:11)
          (Hexamethylenetetramine)   (Phenols)

TSVETKOV, V.h.; SKULdi, V.S.

Visual nephelometer. Opt. i spektr. 7 no. 6:806-817 D '59.
(MIRA 14:1)
(Nephelometric analysis)

TSVETKOV V N

PHASE I BOOK EXPLOITATION   SOV/4985

International symposium on macromolecular chemistry. Moscow, 1960.

Mezhdunarodnyy simpozium po makromolekulyarnoy khimii, SSSR, Moskva, 14-18 iyunya 1960 g; doklady i avtoreferaty. Sektsiya II. (International Symposium on Macromolecular Chemistry held in Moscow, June 14-18; Papers and Summaries) Section II. [Moscow, Izd-vo AN SSSR, 1960] 559 p. 5,500 copies printed.

Sponsoring Agency: The International Union of Pure and Applied Chemistry, Commission on Macromolecular Chemistry

Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemists interested in polymerization reactions and the synthesis of high-molecular compounds.

COVERAGE: This is Section II of a multivolume work containing papers on macromolecular chemistry. The papers in this volume treat mainly the kinetics of various polymerization reactions initiated by different catalysts or induced by radiation. Among the research techniques discussed are electron paramagnetic resonance spectroscopy and light-scattering interpolation. There are summaries in English, French and Russian. No personalities are mentioned. References follow each article.

Tsvetkov, U.N.

15(6)
AUTHOR: Deriadar, P. A., Academician   SOV/30-59-1-5/57
TITLE: New Trends of Colloid Chemistry (Novyye puti razvitiya
               kolloidnoy khimii)
PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 1, pp 44-51 (USSR)

ABSTRACT: At present, colloid chemistry plays an especially important
               part in political sense, as it is a physical-chemical science
               concerning substances of modern engineering. It is of great
               practical importance that at present it is possible to carry
               on uninterrupted transitions from lyophobic to lyophilic
               systems. Thus, it is possible to obtain technically important
               substances with the required structural-mechanical properties.
               The theory of highly molecular substances and their solution
               has developed into an independent branch of colloid chemistry.
               The vitality of modern colloid chemistry is proved by the
               fact that it produces many new independent branches of science.
               Further, the author describes the course of the 4th All-Union
               Conference of Colloid Chemistry which took place in Tbilisi on
               13-16, 1958. It was organized by the Otdeleniye khimiches-

               V. A. Kargin, Z. Ya. Berestneva described the synthesis of
               aluminum-silicon jelly of crystalline structure.
               V. I. Tvelyev et al. examined the optical properties of
               macromolecular solutions and their structural peculiarities.
               P. A. Rebindin and collaborators reported on questions of
               compatibility of polymers and their solutions.
               V. A. Kargin, P. I. Ember and collaborators discussed the
               process of gelatin formation and its role in sticking

               S. M. Lipatov, S. I. Matyrova referred to the colloidal
               properties of thermochemical and electrochemical examination
               methods of the transition of gelatin jelly into a liquid
               solution at a rise in temperature.
               A. I. Yurzhenko and collaborators (Lvov), P. M. Dogadkin
               reported on the clarification of polymerization processes in

               B. V. Dzregolski, Ph. D.-shkin, S. S. Ivanski, A. P. Pisa-
               renko and collaborators examined the process of the influence
               of active fillers on the processes of structural formation
               of polymers.
               A. V. Dumanski with his school, A. A. Trapesnikov, G. V.
               Vinogradov and collaborators examined the properties of soap
               solutions in connection with their structural peculiarities
               and the theory of consistent lubricants.
               The reports on questions of dispersion systems in polymers
               showed the utility of a combination of problems of colloid
               chemistry and the physical chemistry of polymers. The results
               of the Conference indicate that, besides limited conclusions
               of individual scientific problems, comprehensive congresses
               are also useful and necessary, uniting the investigators and
               completing the results of achievements in wide fields of
               science. There is 1 Soviet reference.

               of spontaneous dispersion of colloids and theoretical criteria
               in surface-active surroundings.
               V. I. Likhtman reported on the appearance of adsorptive
               plastification of lead and tin at normal temperatures.
               P. A. Kagariitzki and collaborators examined the influence
               of rheological properties of printing colors on their
               behavior in the printing process.
               I. N. Vlodavets reported on the regulation of crystallisation
               and coagulation structures in the production of best table-
               butter.

Card 5/6

Card 6/6

TSVETKOV, V.N.; CHANDER, R.K.

Diffusion, viscosity, and molecular dimensions of polydimethyl-
siloxane in solution. Vysokom.soed. 1 no.4:607-612 Ap '59.
                                           (MIRA 12:9)

1. Leningradskiy gosudarstvennyy universitet.
                (Siloxanes)

TSVETKOV, V.N.; LYUBINA, S.Ya.

Flow birefringence of polybutylmethacrylate solutions. Vysokom.
soed. 1 no.6:857-862 Je '59.   (MIRA 12:10)

1.Institut vysokomolekulyarnykh soyedineniy AN SSSR.
        (Methacrylic acid)   (Refraction, Double)

5 (3), 5 (4)
AUTHORS: Tsvetkov, V. N., Magarik, S. Ya.   SOV/20-127-4-32/60

TITLE: Optical Anisotropy of Molecules of Isotactic Polystyrene

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 4, pp 840 - 843
            (USSR)

ABSTRACT: The isotactic and atactic polymeric molecules with different
            structures could hitherto only be observed in the solid phase.
            On the other hand, the investigation of the structure of the
            polymers by the methods available is only possible in dilute
            solutions. The present paper tries to investigate the stereo-
            specific features of the above polymers by comparative investi-
            gations of the optical anisotropy of the isotactic and atactic
            forms. Investigations were carried out by means of polystyrene.
            From X-ray pictures, the crystalline structure of isotactic
            polystyrene was determined. The molecular weight was determined
            by the light diffusion in toluene to be equal to 800,000. The
            X-ray pictures were made by L. A. Volkova at the laboratory of
            Professor M. V. Vol'kenshteyn, and the molecular weight was de-
            termined by V. Ye. Eskin at the laboratory mentioned below. The
            optical anisotropy was determined by measuring the radiation

Card 1/3

Optical Anisotropy of Molecules of Isotactic Poly-   SOV/20-127-4-32/60
styrene

double refraction in a bromoform solution (bromoform has the
same refractive index as polystyrene without a form effect).
For the ratio $[n]/[\eta]$, which permits calculations of $(\alpha_1 - \alpha_2)$
= the difference of the two principal polarizabilities of a
statistic molecule segment, the Peterlin's relation $\Delta n/g(\eta - \eta_0)$
was used. In this case, the concentration of polystyrene in the
solution need not be determined. η, η_0 are the viscosities of
the solution and solvent. Table 1 shows the values for the
double refraction and the viscosity of the two types of sty-
rene. $[n]/[\eta]$ amounted to $-20.0 \cdot 10^{-10}$ for the isotactic mole-
cule, and to $-13.1 \cdot 10^{-10}$ for the atactic molecule. The values
for $[n]/[\eta]$ and $\Delta n/g(\eta - \eta_0)$ were in good agreement. The optical
anisotropy $(\alpha_1 - \alpha_2)$ was calculated by the formula in reference
18. It amounted to $-224 \cdot 10^{-25}$ and $-146 \cdot 10^{-25}$ for the two forms.
The latter value agrees with data of other papers (Refs 20-24).
The difference found for the optical anisotropy was ascribed

Card 2/3

Optical Anisotropy of Molecules of Isotactic Poly-   SOV/20-127-4-32/60
styrene

to two causes: (1) A change in the configuration of the prin-
cipal molecule chain, an increase in the stereoregularity,
change the optical anisotropy. (2) By the transition of the
molecule to a more stereoregular state, the degree of delayed
turn in the lateral groups of the molecule varies. In the
transition from the isotactic to the atactic molecule, a
delayed turn of the $C_{aliphat}-C_{aromat}$-bond takes place, which
enlarges the negative anisotropy of the chain, which was also
detected in investigations. The method used can also be applied
to a quantitative determination of the degree of stereoregu-
larity of polymers. There are 4 figures, 1 table, and 28 ref-
erences, 12 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR
(Institute of High Molecular Compounds of the Academy of
Sciences, USSR)

PRESENTED: March 27, 1959, by A. A. Lebedev, Academician

SUBMITTED: March 27, 1959
Card 3/3

TSVETKOV, V. N., MAGARIK, S. YA., BOYTSOVA, N. N. and OKUNEVA, M. G.   (USSR)

Stereospetsifichnost i opticheskie svoistva polimerov
Stereospecificity and optical properties of polymers
IUPAC S II: 378-87

report presented at the Intl. Symposium on Macromolecular Chemistry, Moscow,
14-18 June 60.

SATOVSKIY, Boris Ivanovich; YARTSEV, Grigoriy Matveyevich; YASHNEV,
Dmitriy Andreyevich [deceased]; TSVETKOV, Vladimir Nikolayevich;
POLESHCHUK, Pavel Iosifovich; DIDKOVSKIY, D.Z., otv.red.;
KAUFMAN, A.M., red.izd-va; BOLDYREVA, Z.A., tekhn.red.

[Modern excavators for open-pit mining] Sovremennye kar'ernye
ekskavatory. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po gornomu
delu. 1960. 423 p.   (MIRA 13:11)
               (Excavating machinery)

TSVETKOV, V.N.; LYUBINA, S.Ya.

    Volume effects and shape asymmetry of macromolecular chains
in solution. Vysokom.soed. 2 no.1:75-81 Ja '60.
                            (MIRA 13:5)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.
      (Macromolecular compounds)

SKAZKA, V.S.; TSVETKOV, V.N.; ESKIN, V.Ye.

Asymmetry of the critical opalescence in polymer solutions.
Vysokom. soed. 2 no.4:627-628 Ap '60.   (MIRA 13:11)
                        (Polymers)

TSVETKOV, V.N.; SHTENNIKOVA, I.N.

   Flow birefringence of poly-para-tert.butylphenyl methacrylate
   solutions. Vysokom.soed. 2 no.5:646-657 My '60. (MIRA 13:8)

   1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.
        (Methacrylic acid)   (Refraction, Double)

TSVETKOV, V.N.; SHTENNIKOVA, I.N.

Form of ethylcellulose molecules. Vysokom.soed. 2 no.5:808-816
My '60. (MIRA 13:8)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.
(Cellulose--Optical properties)

87024

S/190/60/002/007/003/017
B020/B052

15.8116

AUTHORS: Tsvetkov, V. N., Frisman, E. V., Boytsova, N. N.

TITLE: Optical Anisotropy and Shape of Siloxane Polymer Molecules
             in Solution

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 7,
             pp. 1001-1009

TEXT: Here, the flow birefringence method is applied for the investigation
of polydimethyl siloxane (PDMS) and polydimethyl-phenyl siloxane (PDMPS)
solutions. The samples investigated were fractions of the commercial poly-
mers PDMS and PDMPS; the latter, however, contained 10% monomer chain
links with a benzene ring as substituent of the methyl group. The molecular
weights of the fractions investigated were determined by the light scat-
tering method (Refs. 2,3) and, in the case of PDMS, also from the in-
trinsic viscosity in toluene by the equation

$[\eta] = 4.2 \cdot 10^{-4} \, M^{0.59}$ (1) (Ref. 2). Gasoline was used as solvent in the
determination of the anisotropy of the molecular segment on the basis of

Card 1/4

87024

Optical Anisotropy and Shape of Siloxane
Polymer Molecules in Solution

S/190/60/002/007/003/017
B020/B052

birefringence. The birefringence of the PDMS fractions in toluene were
measured for the investigation of the effect of shape. The absolute vis-
cosity η and intrinsic values $[\eta]$ of all solutions were determined
besides their optical characteristics. Fraction II ($M=1.79 \times 10^6$) and an
unfractionated PDMS sample with an average molecular weight of 7.10^5 in
gasoline, were examined. In all the cases, the dynamic birefringence Δn
increased proportionally to the velocity gradient g (Fig. 1). The con-
centration dependence of the quantity $(\Delta n/gc\eta_0)_{q \to 0}$ (with η_0 denoting
the viscosity of the solvent) is given in Fig. 2. The characteristic
values of birefringence $[n] = \lim_{\substack{c \to 0 \\ q \to 0}} (\Delta n/gc\eta_0)$ obtained by extrapolation
of the straight line of Fig. 2, are given in Table 2. Three fractions of
PDMPS (III, V, and VII) in gasoline were investigated. The birefringence
of all solutions was negative and very low. For the determination of the
characteristic values $[n]$ and $[n]/[\eta]$ therefore the Peterlin method
(Tables 1 and 2) was also applied besides the graphical solution of the
equation $(\Delta n/gc\eta_0) = f(c)$ (Fig. 3) for fractions V and VII (where the

Card 2/4

87024

Optical Anisotropy and Shape of Siloxane   S/190/60/002/007/003/017
Polymer Molecules in Solution   B020/B052

extrapolation of $c \to 0$ seems less promising). Table 3 gives the characteristic data of PDMS in toluene. The dependence of

$[\eta] / [\eta] \cdot (45 n_s kT)/(4 \pi (n_s^2 + 2)^2)$ on $M/[\eta]$ and

$[\eta]_f \left\{ \left[(n_k^2 - n_s^3)/n_s^2 \right] \left[1/120 \pi p^2 RT \right] \right\}$ of the molecular weight of polydimethyl siloxane in toluene are given in Figs. 4 and 5. Fig. 6 shows the trans-chain of polydimethyl siloxane, and Fig. 7 the monomer link of methyl-phenyl siloxane. On the basis of the data obtained one may say that the quantity of the effect of shape is proportional to the molecular weight of the fraction. The determined asymmetry of the coiled PDMS is somewhat lower than the values ιusually obtained for Gauss chains. The segmental anisotropy of PDMS in gasoline is $4.7 \cdot 10^{-25}$ cm^3, and that of PDMPS is $2.3 \cdot 10^{-25}$ cm^3. Thence the anisotropy of the monomer link was calculated: $0.96 \cdot 10^{-25}$ cm^3, and $13.4 \cdot 10^{-25}$ cm^3, respectively. From these data the difference in the anisotropy of the compounds SiC and SiO can be calculated as being $1.1 \cdot 10^{-25}$ cm^3. On the basis of the data obtained for PDMPS one

Card 3/4

87024

Optical Anisotropy and Shape of Siloxane
Polymer Molecules in Solution

S/190/60/002/007/003/017
B020/B052

may say that practically no slowing down of the phenyl side-group (in the
sense of a favored orientation of its faces) occurs during its rotation
round the valence bond $C_{aromat.} - C_{aliphat.}$. The authors thank I. K.
Stavitskiy and V. M. Svetozarova for having supplied the polymer samples.
There are 7 figures, 3 tables, and 19 references: 13 Soviet, 3 US,
2 German, and 1 Swiss.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo univer-
               siteta (Physics Institute of the Leningrad State University)

Card 4/4